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ABSTRACT

This discussion of the potential for computerized conferencing as the first cost effective technology for the delivery of a classroom environment in a remote learning situation begins by comparing remote learning modes and reviewing various educational experiments that have used the Electronic Information Exchange System (EIES) during the preceding five years. Arguing that this emerging technology can support the concept of a "virtual classroom" at a cost affordable by the average student, the paper then describes two upper division courses on the management of computer and information systems that have been offered through EIES by the New Jersey Institute of Technology. Responses to a survey of student attitudes toward the course and the means of delivery are also reported. The major findings indicated that: (1) students generally felt comfortable communicating in this medium, although some had reservations about taking an entire course through this medium, and some reported difficulties associated with having only limited typing skills; (2) most of the students who felt they did not learn much through the use of this technology were students with low course grades who perhaps did not have the requisite motivation or talent; and (3) student-teacher interaction using computer conferencing generated more work and time involvement for each instructor on a per student basis. It is noted that this paper is not meant to be a balanced presentation of the pros and cons of this technology, but rather an advocacy of further experimentation with its use in distance education, including the development of a graphical interface. (2 figures and 12 references) (EW)

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# REMOTE LEARNING: TECHNOLOGIES & OPPORTUNITIES

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9/1/85

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# REMOTE LEARNING: TECHNOLOGIES & OPPORTUNITIES

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ABSTRACT:

A discussion of the potential for computerized conferencing as the first cost effective technology for delivery of a classroom environment in the remote learning situation.

## COMPARISON OF REMOTE LEARNING MODES

The oldest and most common approach to remote learning is the traditional correspondence course. Its success depends upon the type of topic taught, the motivation and talents of the student and the quality of the course materials, readings, and discussion material. Clearly skill courses are easier to teach this way than say design courses which require a constant awareness by the professor of how the students are interpeting the material. Highly motivated students can often learn better with correspondence delivery than in normal classroom meetings. However, those that need the inspiration that can be generated by a good instructor and the peer motivation generated by the students may do considerably worse.

Recent major commercial efforts have amplified the traditional correspondence approach with instructional software packages. Most of these CAI (Computer-Assisted Instruction) packages emphasize drill and practice to teach typing, computer use, math skills, and other subjects. In at least one commercial example (Telelearning), students are able to electronically message questions to an assigned "instructor."

Current developments in interactive video disc technology promise to further enhance CAI technology. Students will use simulated "virtual laboratories" for subjects such as physics, chemistry, and statistics. For instance, a biology student might dissect a simulated animal. Students can learn the concepts of physical theories much more effectively by testing them in simulation mode than by just reading about them and working out the underlying mathematics. The power of interactive video disk technology will allow students who cannot learn just from pure abstraction to integrate these abstractions with their physical representations. Furthermore students will be able to use "virtual laboratory" facilities impossible on even the best of University Campuses; for example, testing the laws of physics on the moon or varying the plant layout of a major assemblyline.

This emerging generation of video-micro based CAI systems will help the mass of students, who need drill and practice, to absorb sophisticated concepts and skills. Major investments are being made by industry and academia to develop these systems. The problem will not be a lack of available packages, but the need to determine which are the better ones and how they can be integrated into a learning program.

However, these CAI packages will not work for many learning needs. The essence of a college education involves more than simply learning skills and concepts. It requires experimenting with the skills and concepts, finding one's own approach toward using them, and incorporating them into one's frame of reference. These educational "pragmatics" cannot be put into a

textbook or CAI package. They emerge only in discussion, where an instructor associates the material with the students' "frames of reference."

Making Shakespeare meaningful to a group of students depends on relating it to their shared experiences and cultural base. The chances are greater of insuring that students have understood a point or insight the instructor has made if questions can be raised and answered at the time the point is made. Class discussions of examples and case studies are what insures a uniform or class wide understanding.

The problem of "pragmatics" is particularly acute in such areas as business and management, the social sciences, scientific or technical design subjects. This includes a significant portion of the upper division college curriculum, especially those courses which prepare students for specific fields of employment. In these classes, a good instructor often plays the role of facilitator, allowing students to arrive at their own insights by reasoning within a group. None of the CAI technologies, for all their sophistication, can include this crucial element of the learning process. If they could, colleges and universities would be rapidly phased out of existence.

To reach out to remote students, colleges and universities must present some form of the classroom environment. Only five technological approaches allow this: video teleconferencing, audio conferencing, computer conferencing, video recording, and audio recording. Several major considerations rapidly narrow the choice between these. For example, most remote students are older, have full-time jobs and families, or live in rural areas. They face considerable difficulty in adjusting their time to meet fixed commitments every week. This is a strong reason to reject any approach that requires them to set aside the same time every week for a simultaneous video or audio conference.

The most promising approach in video conferencing is NTU (National Technical University) where companies install fairly expensive video oriented classrooms, provide time off to employees to take courses and a consortium of Universities are supplying live video courses. However, this does not service students not in companies able or willing to make the entry investment. To be cost effective a company must have a significant population of students able to utilize the equipment at that location. Video conferencing is still too expensive for most colleges and universities on an individual basis.

Audio conferencing, though affordable, does not adequately convey many of the non-verbal cues associated with the classroom environment. The remote student often finds it too frustrating to participate fully through an audio link to a face-to-face class discussion. Audio conferencing also works only for a limited number of people (3-5) unless specialized high-fidelity telephone equipment is used to help give cues for such visual decisions as who will speak next.

It would seem to be more effective to provide a recording of a class to remote students than to try and involve them in an audio conference. With a recording the remote students don't expect to be included in discussion; they can observe the enthusiasm of the rest of the class. In an audio conference the remote students are more likely to suffer frustration because the promise of being part of the process is so difficult to realize.

Since video playback units are now common in many households, video recordings are almost as accessible as audio recordings and far more preferable for remote learning. A recorded videotape can capture the non-verbal cues that lend excitement to a class discussion. But neither audio nor video recordings offer direct participation in class discussions. Also, for many instructors and students, video presentations are not an easy medium to adapt to. It has its own unique set of psychological problems (e.g. the "Hollywood Syndrome").

Computer conferencing, the newest option for remote learning, allows students, at the time and place of their own convenience, to engage in active discussion with the class as a whole. The only limitation is that each student must own or have access to a microcomputer or terminal. While this may not be universal at the moment, no one doubts the rapid penetration in the consumer market of microcomputers. A serviceable terminal can cost anywhere from $250 (a Commodore 64 plus modem and software) on up.

The reference list summarizes the literature associated with the use of computer conferencing for education. The literature shows clearly that the practiced user can present the same level of emotional non-verbal cueing in computer conferencing that normally exists in face-to-face class environments. The participant can adapt his or her writing style, or use some generally accepted written cues, to convey the equivalent of the nod of a head, a smile of agreement, a frown of disagreement, or a chuckle.

Since this is a comparatively new technology, whose use in education has been pioneered at the New Jersey Institute of Technology, we wish to carefully consider some of the evidence which promotes the use of this technology for remote learning. The paper is not meant to be a balanced presentation of the pros and cons, but rather an advocacy of further experimentation with remote learning via computer-mediated communication, a technology which is here now but whose applications in this area have been relatively neglected.

## COMPUTERIZED CONFERENCING FOR REMOTE LEARNING

The Electronic Information Exchange System has been used for various educational experiments during the past five years. Under a 1983 FIPSE grant (Fund for the Improvement of Post Secondary Education), the New Jersey Institute of Technology offered twelve seminars on computer literacy to educators at 11 small colleges in the United States. A small number of regular courses at NJIT use EIES as a regular augmentation of undergraduate and graduate credit courses. NJIT's Division of Continuing Education has also offered continuing education seminars over EIES.

The Western Behavioral Science Institute, based in San Diego, also uses EIES for educational purposes, with approximately one-hundred executives enrolled in their two-year seminar program. This program consists of semiannual one-week face-to-face meetings at the Institute offices, and continuous year-round seminar conferences on the EIES system. The average student, generally a corporate president or vice-president, pays $13,000 per year for this program. Considering the students' limited time, large tuition, and managerial experience, they would be extremely critical if this type of classroom delivery did not meet their expectations. An important point of this program and no doubt a significant factor in its success is that it draws on some of the top academics in the country to conduct these on-line seminars. Recently the New School has introduced a set of credit courses being offered totally over the EIES system.

With this technology, colleges and universities can offer their most outstanding professional talent to students anywhere in the country. What choice will a talented student make: an average professor at a college within physical commute distance, or the same course from a Nobel prize winner at a university a thousand miles away which can offer the course remotely?

Colleges and universities which today think they have a certain assured student population base because of their geographical location are in for a rude surprise in the next decade. Also it will be the Continuing Education, Professional Development and Master's level programs that will feel the first impact of these trends.

New York Institute of Technology has introduced computer conferencing into a number of its regular correspondence courses and is now moving that population of students into a "virtual classroom" atmosphere. Both the University of Michigan and the University of Wisconsin have used conference packages to augment regular courses for a number of years. On the Source, a commercial timesharing system for personal computers, one individual regularly offers a private course in creative writing. While this is not an accredited course, this person seems to be doing quite well in this endeavor.

This emerging technology can support the concept of a "virtual classroom", affordable by the average student. The virtual classroom, in our meaning, is the ability to create through asynchronous computerized conferencing the atmosphere and resulting benefits that one can obtain in a physical classroom. A 1982 cost analysis (Turoff, 1982) estimated that a student could take a full year of college courses through a conferencing system for under $5,000 per year. This cost is competitive with the costs of a year at a state college or university when

direct costs of room, board and transportation are included. The costs for delivering the virtual classroom are continually dropping and those for the physical classroom are rising.

However, there has been very little careful evaluation of this technology for learning. Most of the published material has been case study reports by instructors involved in the process. The lack of evaluation does not in itself diminish the concept. The technology is moving very fast and the atmosphere at many Universities is to concentrate on innovation rather than evaluation. As a result, many newcomers to the field are relearning the mistakes of others.

The published reports and the growing use of computer conferencing at an increasing number of institutions indicate that many educators believe strongly that this technology is the wave of the future for remote classroom delivery and an important augmentation of the traditional classroom.

Over the years we have been doing comprehensive surveys of a number of courses at NJIT that have used the EIES system to augment their traditional classroom. We will present here some of the most significant implications of those surveys for analyzing the value of computer conferencing in remote learning.

We will focus on an example of two courses that were an upper division course on the management of computer and information systems (CIS 455) and a required course for the Rutgers Business School PhD. management program on the use of computers in organizations, offered through NJIT (CIS 739). Both these courses were ideal for the use of conferencing technology. They required the student to master many technical aspects, such as the characteristics of computer and information systems with respect to various applications, but also to consider the tradeoffs necessary in choosing between technological alternatives. Anyone who has had to choose between alternative hardware or software for a particular application will recognize the issues are a classic "messy" problem similar to choosing a house or mate. This is exactly the type of consideration where one has to deal with the "pragmatics" of applying management and technological concepts to realistic decision situations.

Each student in these two courses was given an account on EIES. The instructor of each course conducted an ongoing EIES conference in addition to the regular face to face class. Because of the large amount of course material the instructors generally reserved the classroom for lectures and held discussion in the computer conference. The students handed in many written assignments electronically over EIES, where they could be seen by the other students. For example, each student turned in three reviews of current professional articles; the content of these reviews was incorporated into the midterm exam to insure the students would pay attention to the information that they had gathered themselves.

During the 15 weeks of these two courses, the students entered some 17,000 lines of text, comprising both assignments and discussions, into electronic conferences. An average of three student comments per day were made. More than 80% of the students entered 5 or more spontaneous comments during the semester in addition to formal assignments. This represented a level of equality of participation far in excess of normal face-to-face courses.

EIES offers some special features that helped facilitate the educational process. The "question" feature allowed the instructors to enter questions online which required an essay response. Students could not see each others' answers until they had supplied their own answers. Thus the instructors could ask questions that produced overlapping answers, without losing a later student's participation because earlier students had already said part of what a later student had to say. In the face-to-face environment, by contrast, only the first student to answer a question gets to express a given view.

EIES also allows the use of "pen names" so students can make anonymous comments. This was also used by visiting experts from industry, who participated in class discussion without identifying the companies they worked for. Thus managers of computer and information systems could talk freely to the students about mistakes they or their company made which might have caused the loss of millions of dollars. This is impossible or unlikely in the face-to-face classroom environment.

The students in these two courses were deliberately worked harder than in an equivalent face-to-face course. They were exposed to more material and discussion than could have been possible in a face-to-face classroom. In the extensive student course-evaluation surveys, a majority of students felt too much material was covered; however, even those students often rated the resulting learning experience as highly positive. The survey results seem to indicate that the amount of work put into the course correlates positively with students' feelings that they learned more, and with the overall value of the course to students.

Figure 1 shows the response by the students to five key overview questions on a survey done of students using EIES to augment their normal university classes. We merged together the 48 responses from both of the 1983 courses. Although the older, employed students from the Rutgers Ph.D. class reflect a more typical remote learning student than the undergraduate students in the NJIT class, the results hold true for both populations taken separately.

Overall, we conclude from these questions that most students felt comfortable communicating in this medium and that the technology offers a potential for learning much more than is possible in the current classroom structure.

However, some reservations were expressed in the surveys. While two thirds of the students said they would take a course which was taught entirely through EIES, a third said they would not. On other questions, a third of the respondents were not enthused about augmenting all their courses this way, about 15% said they did not feel they learned more, and about 15% said they still felt uncomfortable communicating by this technology.

These latter two responses are easily explained by the statistical correlations conducted on this survey data.

Figure 1
GENERAL RESPONSE ITEMS

1) I would be willing to take course taught only though EIES with no face-to-face lecture if I had adequate access to terminal equipment at home and/or work.

| 37% | 18% | 11% | 0 | 2% | 15% | 17% |
|---|---|---|---|---|---|---|
| : 1 : | 2 : | 3 : | 4 : | 5 : | 6 : | 7 : |
| strongly agree | | | | | | strongly disagree |

2) I would like to have EIES avaliable to augment all my courses.

| 28% | 15% | 7% | 16% | 16% | 7% | 11% |
|---|---|---|---|---|---|---|
| : 1 : | 2 : | 3 : | 4 : | 5 : | 6 : | 7 : |
| strongly agree | | | | | | strongly disagree |

3) The overall performance of the instructor was:

| 30% | 53% | 15% | | | 2% | |
|---|---|---|---|---|---|---|
| : 1 : | 2 : | 3 : | 4 : | 5 : | 6 : | 7 : |
| excellent | | | | | | poor |

4) Communicating via EIES is awkward:

| | 4% | 11% | 20% | 11% | 30% | 24% |
|---|---|---|---|---|---|---|
| : 1 : | 2 : | 3 : | 4 : | 5 : | 6 : | 7 : |
| strongly agree | | | | | | strongly disagree |

5) I learned a great deal more because of the use of EIES.

| 22% | 18% | 30% | 13% | 11% | 4% | 2% |
|---|---|---|---|---|---|---|
| : 1 : | 2 : | 3 : | 4 : | 5 : | 6 : | 7 : |
| strongly agree | | | | | | strongly disagree |

There was a high statistical correlation with those that felt EIES to be awkward as a communications medium with limited typing skill. Other long-term evaluation studies conducted at NJIT's Computerized Conferencing and Communications Center observed that if there is sufficient motivation (which might include desire to use computer conferencing or microcomputers in general), a personal's casual typing speed gradually improves until it is not a deterrent. This includes two-finger typing.

In addition, the potential use of this technology is tied to the growing use of personal computers at home and work. People having access to personal computers are most likely to be the candidate population for this form of remote learning and they will have already overcome or have dealt with such problems as typing.

The students who felt they did not learn much are generally students with low course grades. Most of these students had either a problem of low motivation or talent. It is doubtful that the addition of computerized conferencing to the normal course environment decreased their performance. What we cannot tell from the survey is which students did better because of the use of EIES.

The students generally rated their professor highly. This is important, because otherwise , low ratings of the course material and the instructors' deliveries could have confounded our evaluation of the impact of computer conferencing on the students' views.

We found no unusual correlations to explain why one-third of the students said they would not want to take a course solely through a computer conferencing system, or why one-third said they would not want it to augment all their courses. However, the other two-thirds of the students who answered these two questions felt positively about the use of this technology. Since they attended a regular university in a face-to-face setting, they represent a much more critical audience than the typical remote student.

Probably one of the single biggest shortcomings of the current EIES system and other computerized conferencing systems now being used for education is the lack of graphics. It is currently difficult to deal with equations and diagrams in these text oriented systems. At NJIT we have a major development effort under way to correct this situation.

Figure 2

CORRELATIONS

The following shows which other survey items correlated with the general outcome items from Figure 1. It indicates what sort of considerations were influencing the students in their overall response to the more general items. R is the Pearson's Correlation Coefficient and P is the level of significance probability.

1) I would be willing to take a course taught only though EIES with no face-to-face lecture but with adequate access to EIES:

| R | P | Proposition |
|---|---|---|
| .51 | .0003 | EIES is an advanced state of the art system. |
| .46 | .0014 | Course better learning experience than normal face-to-face course. |
| .42 | .0039 | Want EIES to augment all my courses. |
| .40 | .0065 | EIES leads to feeling involved in course. |
| .39 | .0081 | EIES caused greater student interaction. |
| -.38 | .0089 | EIES was an unpleasant experience. |
| .38 | .0091 | Learned more due to EIES. |
| .35 | .018 | EIES made course more interesting. |
| .35 | .019 | Student comments were useful. |
| -.32 | .027 | Lectures more interesting than conference. |

2) I would like to have EIES available to augment all my courses:

| R | P | Proposition |
|---|---|---|
| -.67 | .0001 | EIES was an unpleasant experience. |
| .56 | .0001 | Course better than normal face-to-face course. |
| .56 | .0001 | EIES made course more interesting. |
| -.48 | .0008 | Prefer to type and hand in reviews. |
| .45 | .0020 | EIES provided better access to instructor. |
| .44 | .0023 | Assignments read by other students a motivation. |
| .42 | .0039 | Willing to take course solely on EIES. |
| -.41 | .0056 | The instructor's comments on EIES were excellent. |
| .39 | .0094 | EIES caused greater student interaction. |
| -.37 | .013 | Use of EIES was not relevant to the course. |
| .36 | .016 | Student comments useful. |
| -.33 | .027 | Prefer to express views verbally. |
| -.31 | .034 | Classroom sessions more interesting than conference. |
| .30 | .045 | Learned more due to EIES. |

3) The overall performance of the instructor was excellent:

| R | P | Proposition |
|---|---|---|
| .73 | .0001 | The class lectures were excellent. |
| .60 | .0001 | The quality of the material provided by the instructor was excellent. |
| .59 | .0001 | Instructor encouraged student expression of views. |
| .45 | .0017 | The choice of assignments was excellent. |
| -.44 | .0021 | Did not learn much from this course. |
| -.44 | .0024 | The course material was dull. |
| -.41 | .0050 | Grading was unfair. |
| .37 | .014 | Instructor's comments on EIES were excellent. |
| .33 | .027 | Lectures more interesting than conference. |
| -.31 | .035 | The instructor did not provide insights. |

4) Communicating via EIES is awkward:

| R | P | Proposition |
|---|---|---|
| .41 | .0050 | Typing is a barrier to use of EIES. |
| -.31 | .034 | EIES provided better access to instructor. |
| .31 | .036 | Prefer to type reviews. |
| .30 | .041 | Prefer verbal expression of views. |
| -.29 | .047 | Instructor's comments on EIES were excellent. |

5) I learned a great deal more because of the use of EIES:

| R | P | Proposition |
|---|---|---|
| .59 | .0001 | EIES caused greater student interaction. |
| .69 | .0001 | Course better than normal face-to-face course. |
| .52 | .0002 | EIES made course more interesting. |
| -.53 | .0003 | EIES usage not relevant to content of course. |
| .51 | .0004 | EIES leads to feeling more involved. |
| -.48 | .0008 | EIES was an unpleasant experience. |
| .40 | .0070 | Other students viewing assignments a motivation. |
| .38 | .0084 | Material in course valuable to my career. |
| .38 | .0091 | Willing to take course solely on EIES. |
| -.36 | .014 | Prefer to type reviews. |
| -.33 | .024 | Did not learn much. |
| -.33 | .028 | Course material dull. |
| .30 | .045 | Student comments useful. |
| .30 | .045 | Want EIES to augment all courses. |

## CORRELATION OBSERVATIONS

* Students using a technology for education and paying for an education want to feel they are getting their money's worth.

The willingness to take a course taught totally through NJIT's conferencing systems was tied to a belief that this was an advanced state of the art system. We suspect this generalizes to any technology based remote learning situation.

* A significant component of learning is communications.

A large number of the correlations associated with learning more and other items of a benefit nature relate to the various forms of communications that took place: exchange of comments, reviews and assignments with other students, easy access to the instructor, feeling of being more involved and more interaction. It is this concept of communications being the fundamental benefit of the classroom environment that underlies the premise of this paper that computerized conferencing provides one of the first opportunities to create a true "virtual classroom".

Some correlations not exhibited here but taken from the rest of the survey also show that:

* Students with access to terminals or micros at home or work made greater use of the conferencing system.

* Students with prior experience with interactive systems had an easier time of using the system.

In general the students most likely to make use of this form of remote learning are those that have and use personal computers.

* The amount of use of the system correlated with the students grade in the course.

* The amount of time spent off line on the course correlated with the students grade in the course.

* Students appear more motivated to do a better job on assignments when they know the other students will see them.

Somehow a professor is a form of confessor and students are not too concerned about some of their assignments. However, when they know the other students will be seeing their answers to questions they are quite concerned about the quality of what they do. This appears to be a strong motivating factor for a large majority of students.

A quarter to a third of the students would prefer the face-to-face environment rather than courses taught or agumented via computerized conferencing. This appears to correlate with factors such as poor typing skills, a preference for expressing views verbally or a lack of writing skill. Especially among technical students writing is not often a strong point. However, these are factors that individuals can correct with training if they have the motivation to do so.

## CONSIDERATIONS FOR INSTRUCTORS

In the classes we surveyed, students rated the instructor highly. We have found elsewhere that an instructor's success in the face-to-face classroom does not necessarily mean success in the computer conferencing environment. While certain techniques, such as the choice of assignments, can be taught to instructors, a move to the "virtual classroom" requires differences in teaching style that can be difficult for an instructor to adapt to.

In the two classes discussed here, each instructor prepared about 5,000 lines of notes for the students which he entered at appropriate points in the discussion. Some of these were outlines of the highlights of his face-to-face lectures. Each instructor also entered about 5,000 lines of spontaneous online response to his students.

There is no doubt that the additional student-instructor interaction of computer conferencing generates more work and time involvement for each instructor on a per-student basis. The size of the class is much more directly proportional to the instructor's workload in this environment than it is in the face-to-face environment.

Instructors must prepare extra materials for delivery to the electronic conference. However, these materials are reusable in subsequent offerings of the same course. Also, some portion of the student contributions are useful in future classes. Right now on EIES there is a public notebook in which upper-division and graduate-level NJIT students have reviewed more than 400 recent professional papers. Students in similar courses or future sections of the same courses can use that data base to find papers for background in their own projects or to avoid duplication in review assignments.

Some of the contributions made by "visiting experts" to these online courses were also saved and accumulated for use in subsequent classes. Thus there is an ever-growing base of course material which can be stored, retrieved, edited and modified much more easily than its equivalent would be on paper. The integration of new material directly into old notes is a simple process. Future courses benefit by the significant contributions of past ones.

No one can claim that every college or university instructor is equal as a teacher or scholar. With any initial move into this or other new education technologies, care must be taken to select both the appropriate course topics and the appropriate instructors. One should start with those instructors who already actively use microcomputers, at least as word processors. These candidates must then use the technology on their own to observe some current "virtual classrooms" in operation.

Team-taught courses are much easier to handle by computer conference than in a face-to-face classroom. It is possible to merge discussion sessions from two similar or overlapping courses at the same or even different institutions. In one case a course at Upsala College was merged with one at NJIT. The Upsala students were largely social science majors and the NJIT students were technical majors. The overlapping material concerned the impact of computer technology on organizations. These very different student groups took obviously different viewpoints in the ensuing discussion. The results were beneficial for both classes.

## CONCLUSIONS AND OBSERVATIONS

It is our belief that there are only two reasonably cost effective technologies for colleges and universities attempting to provide classroom environments for remote students: videotape recordings and computer conferencing.

The first is straightforward and readily implementable on a wide scale. Although the second requires more intense planning, development, and evaluation, it holds the most hope for implementing active virtual classrooms. The growing use of microcompters by professionals and managers indicates a rapidly growing population of potential remote students who will readily adapt and be enthusiastic about computer conferencing as a learning environment. The addition of graphical conferencing to what is now a largely text based technology will open the doors to utilizing this technology for almost any course in the professional fields. There are many other software enhancements that would improve the technology for educational applications (e.g., "electronic gradebooks;" see Sher, 1980, 1981).

The new technologies are already eroding the geographical monopoly held by many institutions of higher education. We believe there is more than sufficient evidence of the promise in this new technology to warrant large scale pilot efforts in the near future. However, we also need a wide scale program of evaluation to gain further understanding of the parameters that lead to successful learning experiences.

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